



Encoding of guideline I: Clinical Algorithm

Presented by:
Martha Michel, PhD
Susana Martins, MD MSc
Samson Tu, MS



Outline

- Controlled Vocabulary and Classes (how to add them)
- Building expressions
- Discuss goals, eligibility, patient characteristics, and testing tool!
- Exercise (~1 hour)



Available from previous sessions

- Formal statements from ATPIII guidelines
- Delineation of boundaries, scenarios in which the DSS will be initiated.



Goals of this session

- Understand controlled vocabulary and what is available
- To encode a collection of diseases, ICD codes, and labs
- To encode patient risk characteristics, goals, authors, and other management guideline items
- To increase comfort and ease in navigating Protégé



Outline

- Controlled Vocabulary and Classes (how to add them)
- Building expressions
- Discuss goals, eligibility, patient characteristics, and testing tool!
- Exercise (~1 hour)



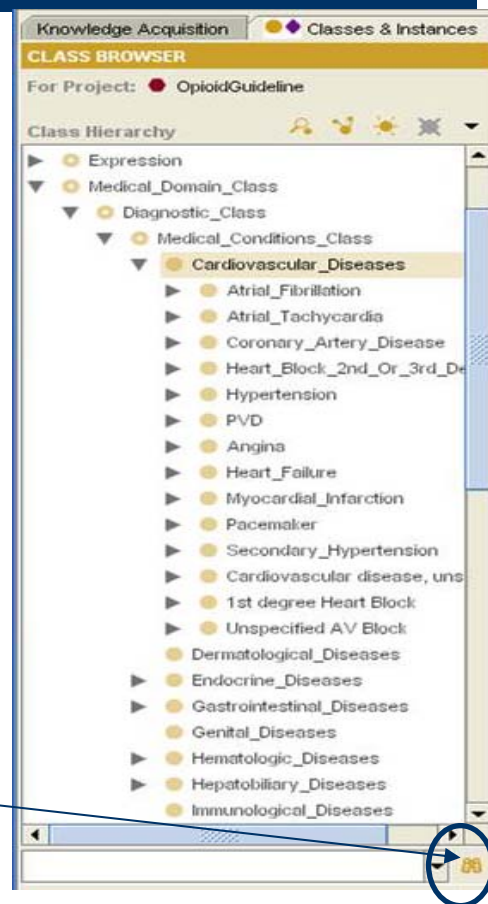
Controlled vocabulary and how it fits into Protege

- Controlled vocabulary are structured ways of organizing information about a domain in a hierarchical format
 - ICD 9 codes (disease codes)
 - LOINC codes (laboratory codes)
 - CPT codes (procedure codes)
- We will primarily deal with ICD9 and LOINC today



Modeling Classes

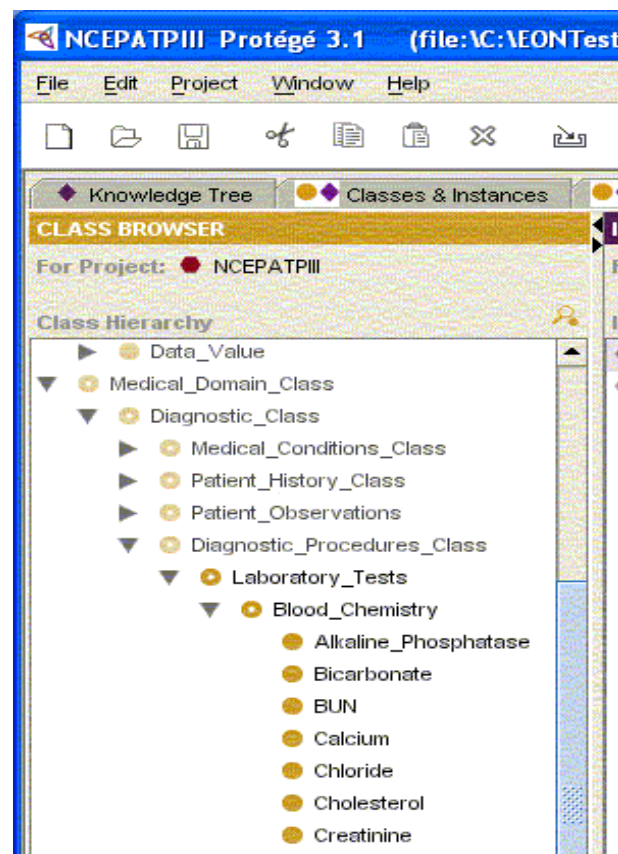
- There are certain ways of modeling that are inherent from the EON guideline model. Others are more flexible.
- EX. ICD9 codes go in Medical Domain Class → Diagnostic Class → Medical Conditions Class
- Within that structure you have some flexibility
- Hint: don't forget about the binoculars for searching and use * as a wild card





Adding Classes for Lab tests

- To add lab tests go to
Medical_Domain_Class →
Diagnostic_Procedures_Class
→ Laboratory_Tests





Outline

- Controlled Vocabulary and Classes (how to add them)
- **Building expressions**
- Discuss goals, eligibility, patient characteristics, and testing tool!
- Exercise (~1 hour)



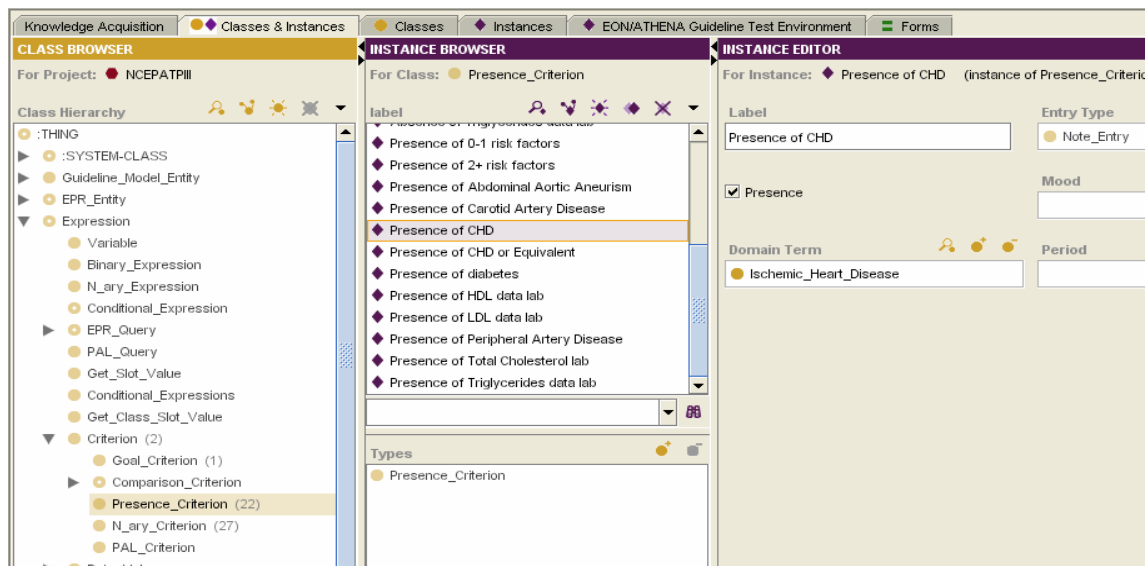
Building Expression Criteria

- Expressions are used to create logical statements so you can reason in Protégé
- 3 types of criteria (for our purposes) will be used to build expressions.
 - Presence
 - Numeric term and General comparison
 - N-ary



Presence criteria

Asks the system if a certain condition (drug, disease, even expression) is present (or absent)
Ex: Presence of CHD





Numeric criteria

- Criteria that uses numeric comparisons
- Ex: LDL<100 mg/dL

The screenshot displays the EON/ATHENA Guideline Test Environment interface, which is divided into three main panels: CLASS BROWSER, INSTANCE BROWSER, and INSTANCE EDITOR.

CLASS BROWSER: This panel shows a class hierarchy for the project "NCEPATIII". The hierarchy includes:

- Get_Slot_Value
- Conditional_Expressions
- Get_Class_Slot_Value
- Criterion (2)
 - Goal_Criterion (1)
 - Comparison_Criterion
 - General_Comparison_Criterion (1)
 - Numeric_Term_Criterion (24)**
 - Numeric_PAL_Criterion
 - Presence_Criterion (22)
 - N_ary_Criterion (27)
 - PAL_Criterion
- Data_Value
- Medical_Domain_Class
- Diagnostic_Class
- Medical_Conditions_Class

INSTANCE BROWSER: This panel shows a list of instances for the class "Numeric_Term_Criterion". The instances are:

- 10-year CVD risk >= 20%
- 2+ LDL-lowering drug
- 2+ Risk Factors
- Age >= 20
- Age > 45
- Age > 55
- HDL < 40
- LDL < 190 mg/dL
- LDL >= 190 mg/dL
- LDL < 100 mg/dL**
- LDL < 130 mg/dL
- LDL < 160 mg/dL
- LDL >= 100 mg/dL

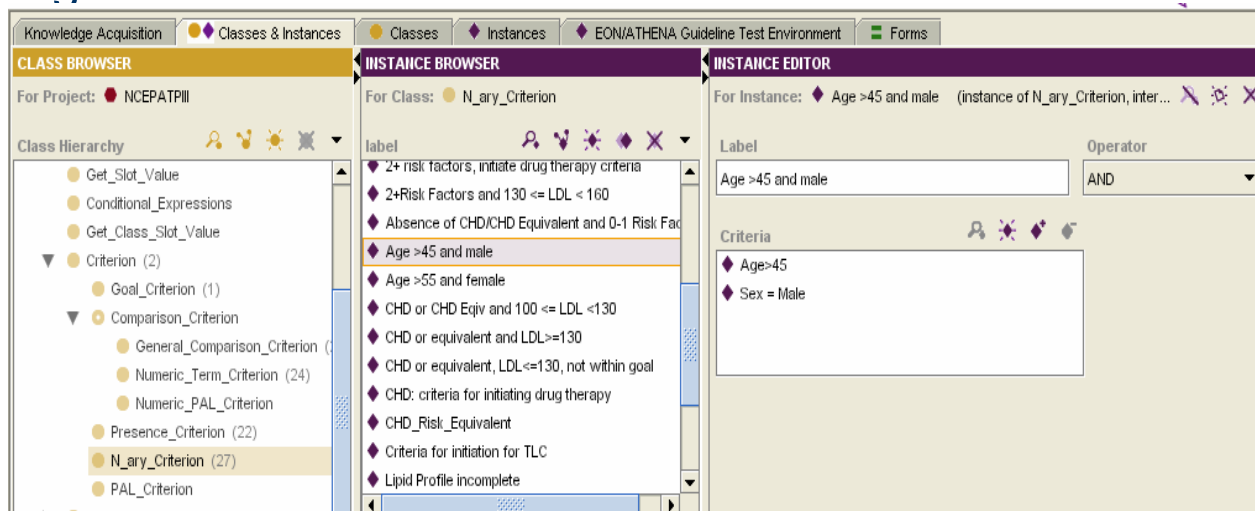
INSTANCE EDITOR: This panel shows the details for the instance "LDL < 100 mg/dL". The fields are:

- Label:** LDL < 100 mg/dL
- Numeric Domain Term:** LDL
- Operator:** <
- Value:** 100.0
- Default Value:** (empty field)
- Mood:** (empty field)
- Aggregation Op:** most_recent
- Assume If No V:** (empty field)
- Entry Type:** Numeric_Entry



N-ary criteria

- N-ary combines different types expressions by using **AND** or **OR** or **NOT**.
- Reminder: **AND** - If all criteria are met, expression is true
OR – If one of the criteria is met, the expression is true.
- Ex: Age < 45 **AND** Male





Outline

- Controlled Vocabulary
- Classes (how to add them)
- Building expressions
- Discuss goals, eligibility, patient characteristics, and testing tool!
- Exercise (~1 hour)

INSTANCE EDITOR

For Instance: ♦ NCEPATPIII (instance of GuidelineView, internal name is NCEPATPIII_Instance_2)

Guideline (1 values)

Identifier

NCEPATPIII

Title

Knowledge base for implementation of NCEP ATP III drug therapy

Authors

Version

Clinical Algorithm



♦ Lipid management algorithm

Eligibility Criteria

- ♦ Age \geq 20
- ♦ Absence of Pregnancy

Goal



- ♦ LDL goal: CHD or equivalent
- ♦ LDL goal: 2+ risk factors
- ♦ LDL goal: 0-1 risk factor

Patient Characterization

- CHD_Or_Equivalent
- 2+_Risk_Factors
- 0-1_Risk_Factor

References





Adding goals

- Goals are defined within the guideline (in our case different LDL goals based on different risk factors)
- The goals should be mutually exclusive (one patient – one goal)



Eligibility criteria

- Used to determine whether a patient is eligible for knowledge base

Ex: <20 years are not eligible for ATP III

The screenshot displays the 'INSTANCE EDITOR' window for 'NCEPATP III'. The interface includes a top navigation bar with tabs for 'Knowledge Acquisition', 'Classes & Instances', 'Classes', 'Instances', 'EON/ATHENA Guideline Test Environment', and 'Forms'. The main content area is divided into several sections: 'Identifier' (NCEPATP III), 'Title' (Knowledge base for implementation of NCEP ATP III drug therapy), 'Version', 'Clinical Algorithm' (Lipid management algorithm), 'Goal' (LDL goal: CHD or equivalent, LDL goal: 2+ risk factors, LDL goal: 0-1 risk factor), 'Patient Characterization' (CHD_Or_Equivalent, 2+_Risk_Factors, 0-1_Risk_Factor), and 'Eligibility Criteria' (Age >= 20, Absence of Pregnancy). A detailed view of the 'Age >= 20' criterion is shown on the right, including fields for 'Label', 'Numeric Domain Ter' (Age), 'Operator' (>=), 'Value' (20.0), 'Unit', 'Default Value', 'Mood', 'Valid', 'Aggregation Op' (most_recent), 'Assume If No V.', and 'Entry Type' (Numeric_Entry).



Patient Characterizations

Patient characterizations are abstractions of a patient case that can be used to display recommendations on the GUI.

The screenshot displays the 'INSTANCE EDITOR' window for 'NCEPATPIII'. The window is divided into several sections:

- Title:** Knowledge base for implementation of NCEP ATP III drug therapy
- Authors:** (Empty field)
- Version:** (Empty field)
- Eligibility Criteria:**
 - Age ≥ 20
 - Absence of Pregnancy
- Clinical Algorithm:**
 - Lipid management algorithm
- Goal:**
 - LDL goal: CHD or equivalent
 - LDL goal: 2+ risk factors
 - LDL goal: 0-1 risk factor
- Patient Characterization:** (Highlighted with a blue border)
 - CHD or CHD-Equivalent
 - 2+ Risk Factors
 - 0-1 Risk Factor



Testing your expressions

Knowledge Acquisition | Classes & Instances | Classes | Instances | **EON/ATHENA Guideline Test Environment** | Forms

Select Patient | Patient Data

Demographics		CPTs	
Field Name	Value	Name	CPT Code
Age	19		

Clinical Signs		Labs	
Sign	Value	Lab	Value

Drugs		ADR	
Drug	Daily Dose	ADR	Start

Dx	
Dx/Observation	Value

Compute Recommendations

Results

Class	Reported
Guideline Manager Output (compliance level: strict)	
Patient classification:	
◆ NCEPATPII :false[because Eligibility criteria evaluate to false(It is not the case that Age(19, 0/6-16))]	
No scenario chosen.	
No goal	
Action Choices	

Test environment tab

Click to submit pt data and compute



Workshop activity

- Add building blocks to Knowledge base.
- Add Eligibility Criteria
- Add Goals
- Test one of your eligibility criteria and goals if you have time.
- Please get into pairs and we'll get started.